Holmes

Research

FOR FARMERS

FALL—1957

Chemical Weed Control

Straining Milk

Lecanium Scales

Rhinitis of Swine

Ferguson Tomato

Pie Filling—Surplus Fruit Outlet

Clipping Experiments Guide Pasture Management

Genetic Aspects of Turkey Production

CANADA DEPARTMENT OF AGRICULTURE

95038—1

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CANADA DEPARTMENT OF AGRICULTURE
Ottawa, Ontario

HON. DOUGLAS S. HARKNESS, Minister — J. G. TAGGART, C.B.E., Deputy Minister

FALL — 1957

Vol. 2 No. 4

NOTES AND COMMENTS

Barley growers in some parts of the country will find interest in the announcement of one firm that it will recognize winter barley as suitable for malting purposes. Apparently the winter barley can be used to make up from 15 to 25 per cent of the mix. This may mean that winter barley may soon establish itself as an addition to the list of profitable cash crops in areas where it can be grown successfully.

* * *

And speaking about new crops, the first commercial crop of safflower was produced this year on about 15,000 acres in southern Alberta. The crop was grown on dry land, seeded in rows seven inches apart, at the rate of 20 pounds per acre. Since safflower competes poorly with weeds heavier seeding may be desirable.

* * *

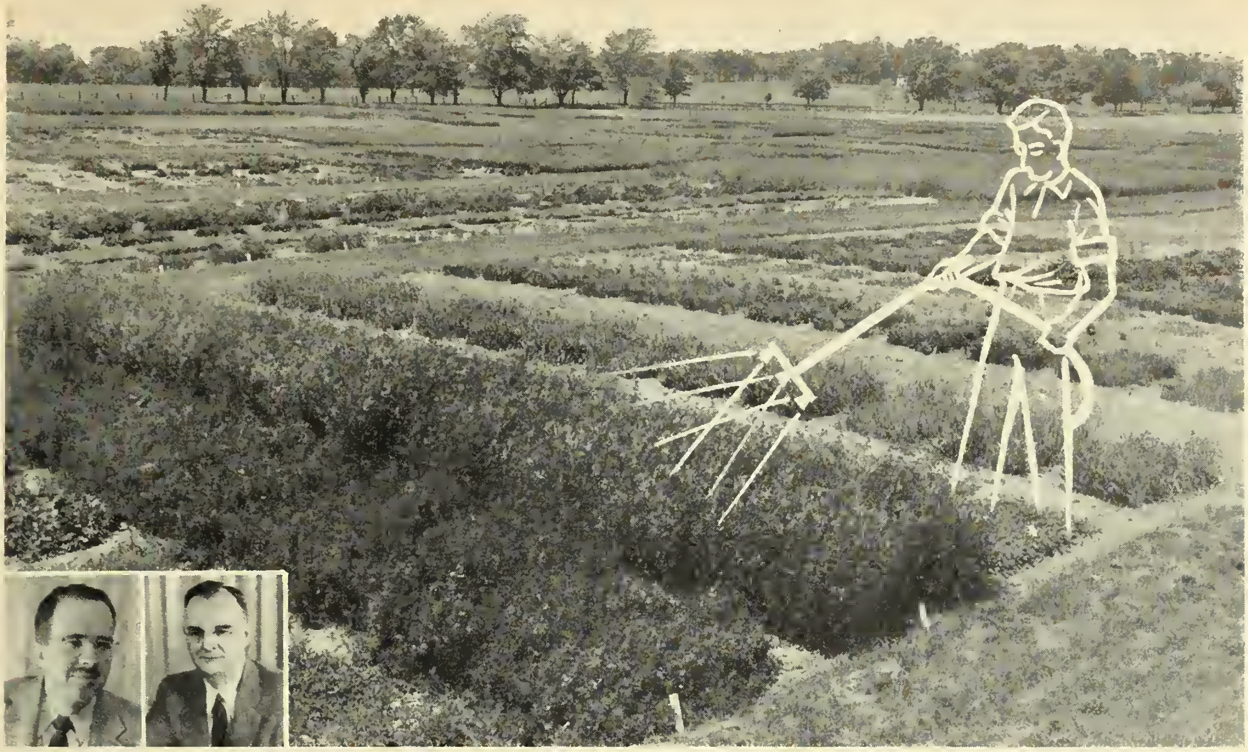
Plant breeders are constantly on the lookout for new sources of germ plasm for the improvement of existing crop varieties. Often this means going back to wild species for genes that carry important characteristics. A case in point is the current effort of the Cereal Division to transfer the characters of disease resistance and winter hardiness from certain wild grasses to common barley. Another is the attempt to incorporate in common oats the resistance to Septoria disease found in related wild species. A difficulty being encountered is that of obtaining fertile seeds from direct crosses with the wild sorts. Progress is being made however by crossing two or more wild species first and then crossing the resultant hybrid with the cultivated variety.

* * *

Nature has resorted to a great variety of devices to maintain the vigor of plant species by ensuring cross fertilization. With many species, some plants bear only female parts while others carry only the male element. In other cases, the male and female elements mature at different times, thus limiting the possibilities of self fertilization. In those species where no such provisions apply, we often find that bright colors or distinctive perfumes have been employed to attract the insects that bring about cross pollination. This business of attraction also plays a part in the insect world. Recent experiments by the Apiculture Division have shown that scent glands on the queen bee fill a vital role during the mating flight. Of 17 queens having their scent glands covered with paint, none mated during the normal period. In a control group similarly marked without covering the scent gland, all mated.

"*Research for Farmers*" is published quarterly by the Canada Department of Agriculture. Its purpose is to help keep extension workers informed of developments in research and experimentation as carried on by the various units of the Department.

***COVER PHOTO*—In processing trials at the Central Experimental Farm, Ottawa, the Ferguson tomato has proved superior as a "whole-pack" tomato to the standard John Baer variety. (See story, p. 11.)**



View of chemical weed control plots, Central Experimental Farm, Ottawa. Inset, authors Hay (left) and Ripley.

Research in Chemical Weed Control

J. R. Hay

AND

P. O. Ripley

INTEREST in herbicides is now high because field studies show that the control achieved with good weed killers is often more efficient or more economical than many of the cultural methods. Even when tillage practices are employed as religiously as weather conditions will allow, certain weeds are not satisfactorily controlled without the use of chemicals.

Modern chemical weed control probably began with the introduction of 2,4-D and MCPA. The ability of these compounds to control annual broadleaf weeds without damage to cereal crops and lawns was astounding. In Canada, the amazing efficiency with which 2,4-D removed wild mustard from grain fields led to its immediate acceptance and widespread use. Within a very short time research workers were able to recommend rates as low as four to eight ounces of 2,4-D in as little as five gallons of water per acre for weed control in grain fields.

Following these early successes methods for control of many broadleaf weeds in other crops belonging to the grass family were soon evolved. Attention was also given to the control of weeds in pastures and rangeland. Invasion of weeds into these areas is often due to low fertility or to overgrazing. Unless these factors are corrected, of course, no amount of herbicide will be effective. When weed killer is applied in conjunction with fertilizers, spectacular yield increases can be obtained once the grass is relieved of competition with the weeds.

Certain deep-rooted, broadleaf weeds are not eradicated by 2,4-D. In some cases, there may be an inherent tolerance to the herbicide but when the area becomes reinfested shortly after treatment often this can be attributed to the method of regeneration of the species. Many perennials commonly send up new shoots from the root. When only the tops are killed, as often happens after foliage application of herbicides, considerable regrowth may arise.

Since the apparent cause for the inability of 2,4-D to eradicate deep-rooted perennial weeds was a lack of movement of the herbicides in the plant, we developed a method of determining how much 2,4-D is translocated downward to the roots. Actually, only very small amounts, insufficient to kill the roots, were found to move downward after application to the leaves. This makes it virtually impossible to eradicate these plants with one application until

The authors are with the Field Husbandry Division, Central Experimental Farm, Ottawa. Dr. Hay is a Weed Control Specialist; Dr. Ripley is Division Chief.

Left: Control of weeds by Alanop without injury to cucumbers. Center: Other crops hove been killed by the herbicide. Right bockground shows the weed growth in check plot receiving no chemicol.

Below: Control of weeds in onions (center) grown on muck soil. CIPC was opplied pre-emergence ot 8 lb. per ocre. A few rogweed plonts were not controlled by this treotment.

ways are found to increase the amounts that do move down.

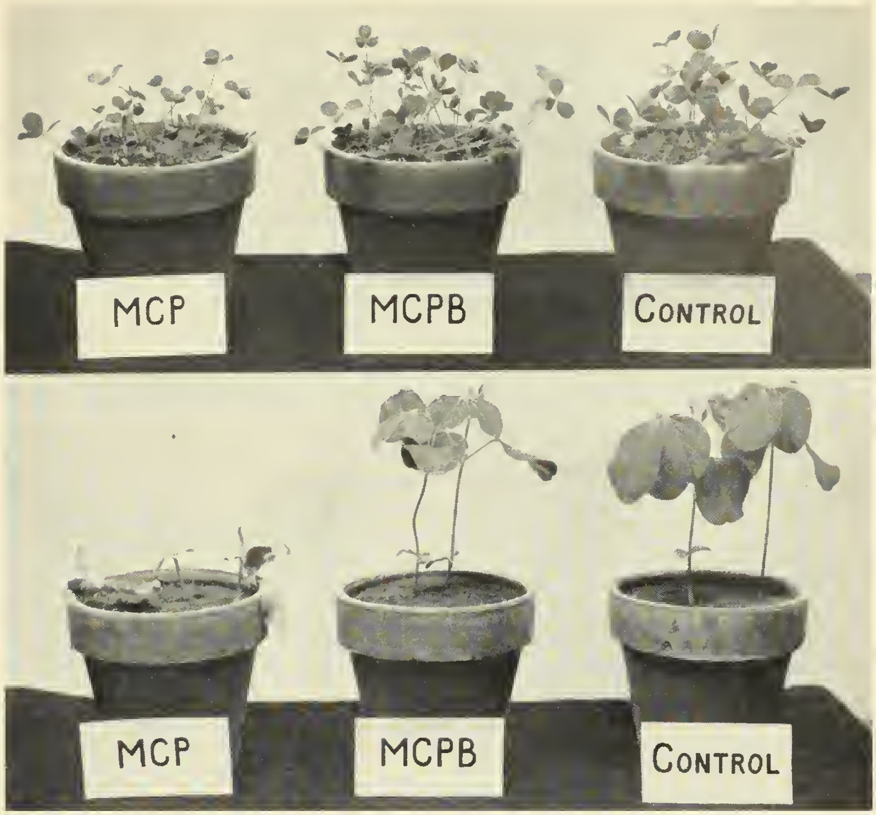
Fortunately, it is still possible to control the top growth from the roots of most weeds with repeated applications of 2,4-D. Thus, although the weeds are not immediately eradicated, the top growth can be continually suppressed. On range and pastureland this will allow grass to grow and become available for the grazing animals, while on cropped areas, the use of selective herbicides with timely cultivation will allow profitable crop production even though the weed is not completely eliminated. Nevertheless, these control measures are not altogether satisfactory and each year new herbicides are tested at Experimental Farms across the country in the search for compounds that will give more effective control and preferably eradication with one or two applications.

The biggest challenge to weed workers today is the need for chemical weed control in broadleaf crops. Some progress has already been made. Young weed seedlings can be killed with Stoddard's solvent without damage to small carrots or parsnips. TCA will eliminate annual grass weeds in flax. CMU gives very good weed control in asparagus beds. Alanap, one of the most recently developed herbicides, gives good control of many weeds without injury to cucurbits. However, the major obstacle to effective chemical weed control in broadleaf crops is the lack of selectivity between crops and weeds shown by the compounds now available. Applying the chemical to the soil surface before the crops emerge may provide a solution since many weed species are particularly susceptible at this time. The object here is to kill the young weed seedlings which germinate near the surface. Under optimum weather conditions, good results can be obtained with dinitrophenol and other herbicides but no weed kill occurs without some soil moisture whereas too much rain may wash the chemical down to the region of the roots of the young crop plants, resulting in severe injury. Some of the new materials being tested are giving excellent results even under adverse weather conditions.

Recently, a group working in England has developed a new herbicide, MCPB. Many species of plants have enzymes which are capable of converting this herbicide to a toxic substance, but some crops, including a number of legumes, apparently lack this ability and are, therefore, not harmed by this compound. This selectivity holds much promise for control of weeds in forage legumes

and peas, and is being widely tested on Experimental Farms. An older chemical, Sesone, has a somewhat similar type of selectivity. It is inactive itself when sprayed on the foliage of plants but it is converted to 2,4-D by micro-organisms in the soil where it kills young seedlings as they germinate.

A seemingly hopeless task is that of chemically controlling grassy weeds in cereal crops. For example, it seems almost impossible to find biochemical selectivity between cereals and wild oats, the most serious weed on the prairies. Control could be achieved if the wild oat seeds in the soil could be killed by a herbicide when mixed into the soil. An intensive search is in progress for a suitable compound for this preplanting application. In laboratory and greenhouse tests, IPC, CIPC, and CDAA are toxic to wild oat seeds. However, where these compounds were worked into the soil outdoors, they have not always been successful. This inconsistency may be due to the difficulty of thoroughly mixing the chemical with the soil. Another disadvantage is that subsequent grain crops may be damaged even when the chemicals are applied during the preceding fall. Wild oats can be controlled in sugar beets, which are tolerant to IPC but further refinements or new chemicals are required before this preplanting method can be safely recommended in other crops.



Upper: Response of red clover to MCP and MCPB, the new material being tested for weed control in leguminous crops. Right, no treatment; center, negligible effect caused by MCPB at 8 oz. per acre, and left shows slight retarding effect caused by MCP at 8 oz. per acre. *Lower:* Comparison of the effect of MCP and MCPB on Hardome soybeans when applied at 4 oz. per acre. Left shows very drastic effect of MCP; center soybeans are only slightly retarded by MCPB, and right, control which received no chemical. These treatments need much more testing before they can be safely recommended.

There is still another possible way of selectively controlling wild oats. If wild oats are sprayed with maleic hydrazide while they are in the milk stage, the resulting seeds will be sterile. Since other crops, particularly early maturing varieties of barley, do not come into this susceptible stage at the same time as the wild oats they are not injured by the treatment. If only sterile wild oats are shattered for three or four years, it is believed that the soil will ultimately be free of this pest. The feasibility of this method is still in doubt, and although a degree of control has been achieved it will be several years before a final conclusion can be reached.

Each year as new compounds become available and as more experience is gained with their use, the list of weeds that are satisfactorily controlled with herbicides grows larger.

Control of wild mustard can be obtained with as little as 4 oz. of 2,4-D per acre. Right foreground is a check plot where no herbicide was applied.

Author (right) discusses with F. D. Murphy, Dairy Products Division, results of cheese extraneous matter tests.

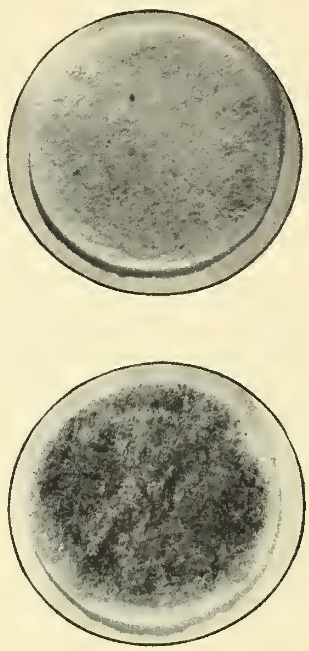
Straining Milk

C. K. Johns

THEORETICALLY, milk should be so produced and handled as to be free from dirt or extraneous matter. In practice, however, some dirt, straw or bedding usually gets in. Since the amount of extraneous matter is a reflection of the care taken before and during milking, some countries, e.g. Switzerland, prohibit the straining of milk on the farm. Straining can also add large numbers of bacteria to the milk if improperly cleaned and sterilized cloth or wire strainers are used.

In North America, milk is customarily strained through a single-service cotton filter pad firmly held in place in a large metal strainer bowl. If the pad is of the correct size and properly centered, and the proper procedure is followed, a high proportion of the extraneous matter is removed. While straining makes the milk look better, it will never take the place of clean milking procedures. 'Cleaned' milk is never as good as clean milk, for no amount of straining will remove soluble material and bacteria. What is actually removed by the strainer pad is often more akin to tea leaves or coffee grounds—the really important part has been dissolved out. Consequently, every effort should be made to keep dirt out of the milk. Clean, well-drained barnyards, stalls of the right length, frequent removal of manure, clipping of the long hair from udder, tail and hind-quarters, frequent grooming of the flanks, careful washing of the udder and teats before milking, clean hands and clothing on the milker—all these are important in reducing to a minimum the amount of extraneous matter entering the milk. Dirt may also be introduced through empty shipping cans that are allowed to stand or lie alongside a dusty road, and sometimes even through sediment in the water used for washing the milking utensils and equipment.

Dr. Johns is Officer-in-Charge of the Dairy Technology Laboratory, Central Experimental Farm, Ottawa.



Upper: Test disc showing sediment from milk that was strained without jarring.

Lower: Here the strainer was jarred against the top of the can 20 times. Note large amount of sediment.

Having taken proper precautions to minimize the amount of extraneous matter, it is important to use the strainer properly. Straining should properly be done only in a conveniently located milk-house, where there is less danger of dust, chaff, etc., being blown into the milk and where flies can be controlled more readily. The provision of a satisfactory milk-house has been mandatory for many years for farms shipping fluid milk for bottling purposes. This requirement will undoubtedly be extended in the near future. Already in the more progressive dairying areas a proper milk-house must be provided before milk can be accepted *even for manufacturing purposes.* Where there is at present no milk-house, and milk is strained into the can in the barn, the strainer should be fitted with a cover that will keep the flies out. Flies swimming in the milk are certainly not going to induce the consumer to drink more milk, while among the numerous bacteria they add are many objectionable for cheesemaking, or capable of causing disease in humans. Where flies are found floating in the milk on arrival at the milk plant or factory, such milk should be returned to the farmer. The finding of flies in the milk in the can is often the result of leaving the can lid ajar in the mistaken notion that this aids in dispelling the 'animal heat'. It should be stressed that this practice is both ineffective and hazardous. Milk cools equally quickly with the can lid on tightly.

The speed with which milk passes through a cotton strainer pad depends largely upon its temperature—the warmer the milk, the faster it filters. Consequently, milk should be strained at the earliest possible moment, particularly during the colder months. There is also a limit to the amount of milk that can be passed through a strainer pad, as it takes longer

with each succeeding pailful. Consequently it is generally recommended that a fresh strainer pad be employed for each 8-gallon can of milk filtered.

Another factor influencing the speed of filtration is the butterfat content. Milk from Channel Island breeds such as the Jersey has not only a higher fat content but also larger fat globules. These tend to clog the filter and slow up the process.

When the milk fails to pass through the strainer fast enough, many producers make the mistake of jarring the strainer bowl against the top of the can in the hope of hurrying up the process. This is a very great mistake, and one that has proved very costly to many producers. This jarring dislodges the finer particles of dirt caught on the fibers of the strainer pad, and they are washed through into the milk. An experiment recently conducted at the Central Experimental Farm, Ottawa, yielded striking evidence of this, as is seen from the accompanying photograph of two sediment discs. Two 8-gallon cans of milk, to each of which had been added equal amounts of soil and barn dirt, were each strained separately through the same type of strainer pad. After straining, a sediment test was run on the milk from each can. The accompanying photographs show the amount of sediment collected on the test discs from milk strained without jarring the strainer and by jarring against the top of the can 20 times. While the jarring was not violent enough to tear the strainer pad, enough fine dirt was dislodged to cause this can of milk to be rejected for excessive sediment.

Sediment, or extraneous matter, has commanded increasing attention since 1942, when a shipment of Canadian cheddar cheese to the United States was rejected on account of the high content of extraneous matter. The need to have our cheese meet any regulatory standard has been recognized by governmental authorities and successive steps have been taken to improve the picture. Since June 1, 1955, the premium for high-scoring cheese paid by the Federal Government has been restricted

Concluded on p. 16

Two apricot twigs (during winter) showing small, living immature lecanium scales, and the much larger, dead, mature scales.

Lecanium Scales Attack B.C.'s Peach and Apricot Orchards

M. D. Proverbs AND *R. S. Downing*

INFESTATIONS of lecanium scale insects on peach and apricot trees in the interior of British Columbia have been considerably more widespread and severe this year than at any other time in the history of fruit growing in the province.

At least three kinds or species of *Lecanium* are injurious to stone fruits in the Okanagan Valley. One species evidently prefers apricot; the other two are most frequently found on peach, although they may attack other tree fruits. The three species of scale are so similar in general appearance that it is difficult to distinguish between them even when they reach the adult stage. They have very similar life histories and habits, and cause the same type of injury.

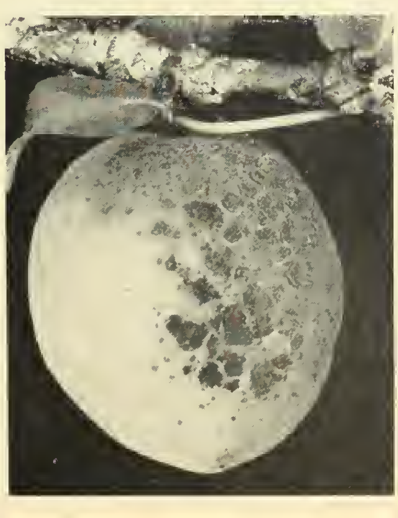
These insects overwinter on one- to four-year-old branches as brownish, immature scales, slightly convex and oval in shape. They vary in length from about 1/32 to 1/16 of an inch. During the first warm days of spring the immature scales wander over the branches until they find a suitable place for feeding, usually on one- and two-year-old twigs. They insert their fine, needle-like feeding apparatus or stylets into the plant cells and suck the sap from the tree.

The scales grow very rapidly during April and May, and are about $\frac{1}{4}$ inch in length when

Continued on p. 10

The authors are Fruit Insect Specialists with the Department's Entomology Laboratory, Summerland, B.C.

Left: Apricot showing scabs where honeydew has killed the plant cells. Dead scales on twig may remain for over two years. Right: Co-author Proverbs infesting small apricot tree with immature lecanium scales to study their life history and habits. Tree is caged to keep out parasites and predators.



RHINITIS of SWINE

This is a nose disease of swine that seriously interferes with growth and may make a hog-raising enterprise unprofitable.

Ronald Gwatkin

Atrophic rhinitis of swine—long known in Europe and more recently in the United States, Canada, and Great Britain—is a disease that to date has been reported from practically all provinces in Canada. Probably the most serious result of the disease is the failure of swine to make satisfactory growth gains. Usually the condition may not be observed for a year or so after an infected animal has been introduced into a herd, after which spread throughout the herd may be rapid. If it continues to spread in Canada, a serious problem in obtaining clean stock could develop.

Generally speaking, pigs become infected while young. Under experimental conditions the younger they are exposed the greater is the chance of establishing infection. The likelihood of producing the disease after six to eight weeks is practically nil. This does not exclude the possibility, however, that older pigs may become carriers of the infection even though they do not show symptoms.

On the basis of clinical observation, atrophic rhinitis has resulted in swine failing to make satisfactory growth gains. This has been confirmed by carefully controlled experiments.

The author is an Animal Pathologist with the Health of Animals Division serving with the Department's Animal Diseases Research Institute, Hull, Que. While Dr. Gwatkin retired in 1955, he has since been recalled to continue necessary research.

In many cases the effects of rhinitis cannot be separated from those of some other condition such as another infection occurring at the same time, improper diet, or a parasitic infestation. In some herds where proper husbandry is practiced, failure to grow is not too marked, but this is not always the case as severe set-backs may occur under excellent conditions of feeding, husbandry, and sanitation.

Symptoms

Early symptoms of rhinitis are those of a cold. There is watery discharge from the eyes and nose and, not infrequently, black circular patches are noted under the eyes due to the overflow of tears which collect dust and dry on in this area. Sneezing is the most pronounced symptom; it led to the original name "sneezing sickness". Irritation of the nasal passages is also in evidence, the pigs vigorously rubbing their snouts on the ground or on any convenient object. There may be difficulty in breathing. Later the nasal discharge becomes thicker, collects in the nose, and is expelled by sneezing. Bleeding from the nose, which is sometimes profuse, is a certain sign of rhinitis. Frequently rhinitis affects the development of the upper jaw, with the result that the snout becomes turned to one side or upwards. However, in many cases there may be no deformity. These changes are not usually observed before eight to ten weeks although we have seen them at 30 days. Owing to the failure of the upper jaw to develop, the incisor teeth do not come together and animals have to scoop up their feed. A turned-up snout and projecting lower jaw are not by themselves indicative of rhinitis. Some short-faced Yorkshire pigs show this deformity.

The infective material is expelled from the nose in droplets of all sizes and these are inhaled by other pigs in close contact with the infected ones. If part of a litter is infected by dropping nasal material into the nostrils, some or all of the other litter mates will become infected if left in the same pen. Injection of infective material does not produce rhinitis; it must be brought in direct contact with the nasal mucous membranes. The infective material is not found in the other body discharges. In view of this, indirect transmission from premises, clothing, etc., is less important but cannot be ignored because nasal material on the ground may come up with dust while still infective. Practical experience suggests that premises do not remain infective for long.

There is not yet agreement on the cause of rhinitis. It has been regularly produced by cultures of *Pasteurella multocida* at this laboratory and others in Canada and abroad. While this microorganism certainly plays a part in the disease, it may be that some other agent is also involved. This question has been under study here and in many other countries.

There is little doubt that many conditions may influence the severity of rhinitis and also the rapidity

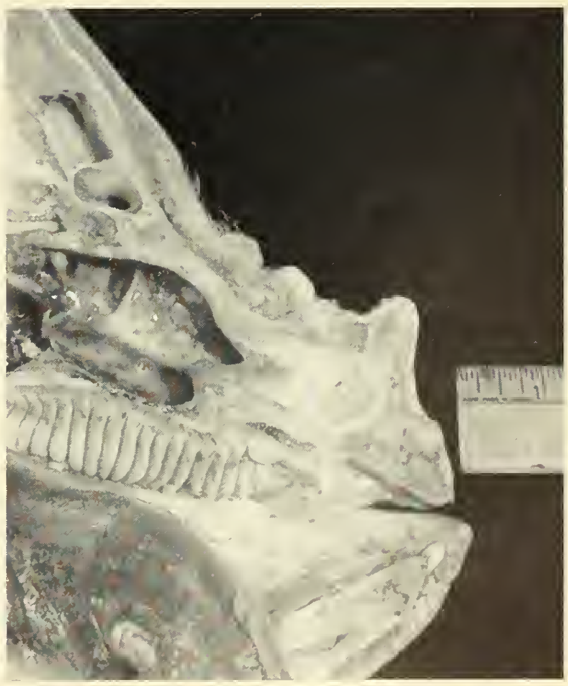
Skulls of short-faced Yorkshire pigs showing one which did not have rhinitis (left) and one which did (right). A turned-up snout and projecting lower jaw, however, are not by themselves indicative of rhinitis as the photos illustrate. Some short-faced Yorkshire pigs show this congenital deformity.

Above: A normal head. When a head is split down the center and the cartilaginous septum removed, the upper, lower, and ethmoid turbinates can be observed; they are normally pink and clean-looking and fill the space in the nasal passages. *Lower left:* Partial destruction and shrinkage of the turbinate bones can be seen. *Lower right:* Complete destruction of the turbinate bones leaving only a large cavity. At birth this pig had normal turbinates, but in the course of the disease the bone disappeared leaving only the covering mucous membrane.

of spread. Rhinitis-infected pigs on a deficient diet present a deplorable spectacle and we have produced a rapid improvement in condition of such animals by correcting the deficiencies. Cold, damp buildings and poor sanitation lower an animal's resistance to any disease and this is often observed in rhinitis-infected herds. The same holds true for heavily parasitized animals. But, on the other hand, severe symptoms do appear in animals on premises on which conditions apparently leave little to be desired.

Diagnosis is usually by clinical examination and requires careful study of the herd history, examination of individual animals, and necropsies on selected cases if there is any doubt. In examining the head during a post-mortem examination, a much clearer picture can be obtained by sawing the head open on the long axis. This entails more work than cutting across sections of the snout but the operator is well repaid by the opportunity of observing the nasal passages and turbinated structures in their entirety.

In the course of our work with rhinitis, various biological methods of diagnosis have been tried without success. Some headway has been made but, until the cause is determined with certainty, such tests can only remain in the ex-



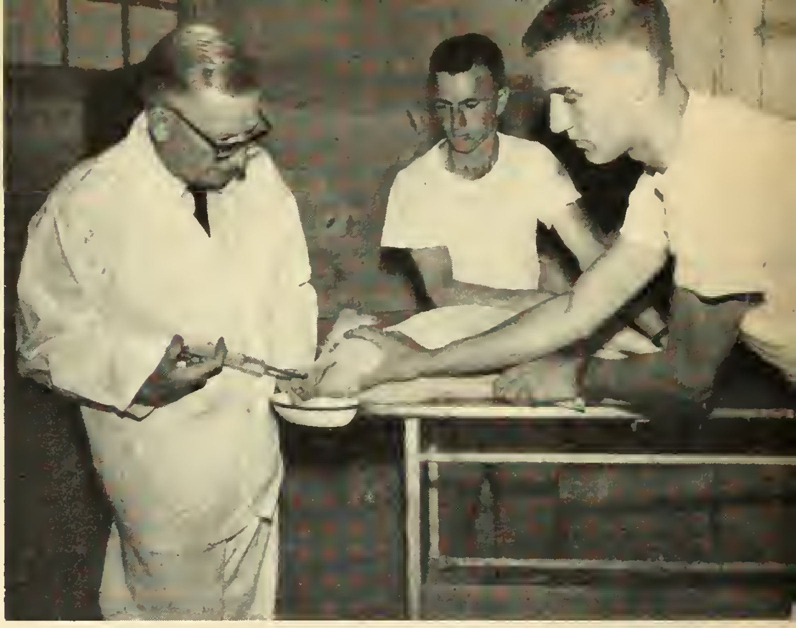
perimental stage. When the whole herd can be observed and there are young, growing pigs in it, a diagnosis can usually be established without too much difficulty. Unfortunately there is no certain way at present of separating all the clean from the infected animals, except by isolation and prolonged observation.

Prevention is of course most desirable but until it is possible to establish and recognize herds that are rhinitis-free there is always the danger of bringing an infected animal into a clean herd, the results of which may not show for a year or more. The majority of herds are probably still free from rhinitis but in making purchases the possible presence of infection should be given careful consideration. Pigs apparently normal may be carriers and spreaders of the infection but in a rhinitis herd of any size there will always be some animals that show evidence of having been infected.

No satisfactory treatment has yet been developed for atrophic rhinitis although Streptomycin and other antibiotics may be of some value. Since the atrophied turbinates do not regenerate, examination of the heads does not shed any light on the effectiveness of treatment. It is necessary therefore to test nasal material, collected from the infected animals before and after treatment, in baby pigs.

There are several different approaches to clearing a herd of rhinitis. Obviously, a sure but drastic method is to dispose of the whole herd by slaughter, thoroughly clean and disinfect the buildings and equipment, and restock from a known clean herd after a period of a month or so. It would be sound practice also to renovate the wallows and drain them. Although there is no indication that the infectious agent tends to persist for long, in the absence of sure information it is wise to be thorough.

Another method is to select sows that have had two or more litters and farrow them in isolation. If the young remain healthy they can be returned to the original piggery which has been disinfected after all the other pigs have been transferred to another house, or alternatively another clean center can be established. If any of the litters, farrowed in isolation, develop rhinitis, they and the sow are removed to the infected group for subsequent slaughter or the sow may be bred and again allowed to farrow in isolation. Some sows remain infected while others recover from the infection and have healthy litters.



Author obtaining nasal washings from a rhinitis-infected pig to be used to infect experimental animals for research purposes.

In a third method, young pigs are selected as being probably clean on the basis of examination of the nasal passages with a special instrument. They are isolated under conditions of litter segregation and a second generation raised under the same conditions.

Since the young do not become infected in the uterus, they can be collected at birth on a clean sheet or removed by Caesarean section and raised in isolation. The former method entails a good deal of trouble and the latter is not practicable, but both have been and are being used under special conditions.

Another system that has been tried and for which success is claimed, is to remove the pigs at birth and return them to the sow at feeding time for the first day or so and then raise them away from the sow. During the feeding periods an attendant must keep the little pigs away from the sow's head. Such a method would again only be possible under special conditions.

Lecanium Scales . . . from p. 7

mature. During the last week of May, and early June, the female lays eggs; these form a mass under the dome-like shell that covers her body. The shell may be eventually packed with as many as 3,000 pearly white, or pinkish, eggs. The eggs hatch from mid-June to late July, the date of hatching varying somewhat with the species, locality, and season. The young scale insects move to the leaves, where they feed until autumn, and then return to the branches to pass the winter.

The lecanium scales cause two distinct types of injury. Since they feed by sucking the sap from the leaves and twigs, they soon devitalize the tree, and may kill one- and two-year-old twigs. More important, however, these insects secrete copious quantities of a fluid known as honeydew that drips on the fruit and foliage. Both peaches and apricots become sticky, but apricots may become marked with brownish scabs where the honeydew has killed the plant cells. Such fruit is usually unmarketable.

Although birds and several species of insect parasites and predators attack lecanium scales

Concluded on p. 14

FERGUSON TOMATO

Interests Growers and Processors

L. H. Lyall

A tomato variety named in 1955 is earning a place for itself amongst growers for the processing industry in Ontario and Quebec. The Ferguson tomato appears to be particularly suited to conditions in eastern Ontario, and is being quite widely used in place of John Baer which, for many years, has been the standard variety grown for processing in that area.

Ferguson was originated by the Horticulture Division, Central Experimental Farm, Ottawa, and is the result of several years of selection from a cross between Bounty and Early Rutgers. In 1949 the most promising selection from this cross was given the distribution number Ottawa TO-17 and was sent out for trial at various locations. The variety has a determinate or "bush" habit as compared with the indeterminate, spreading habit of John Baer. Trials indicate that it can be planted at spacings as close as 5 feet by 2 feet, or 4,356 plants per acre. Such close spacings have given increased yield over the more usual 5 feet by 3 feet or 2,904 plants per acre.

It carries the gene for "uniform" skin color (lack of dark green coloring on the shoulders). This factor gives resistance to yellow ends and a certain degree of resistance to skin cracking.

Since 1950 it has been grown for six seasons in yield trials at the Horticultural Substation at Smithfield, near Trenton, Ont. Each year it has been one of the top-yielding varieties and has consistently shown less fruit-cracking, blossom end rot and yellow or "leather" ends than John Baer. During these six years of testing, its average yield of canning grade tomatoes has been 18 tons per acre compared with 16 tons from John Baer.

TABLE 1. EFFECT OF SPACING OF SUMMER RAINFALLS ON THE YIELD OF THE TOMATO VARIETIES FERGUSON AND JOHN BAER AT SMITHFIELD, ONT.

Year	Regularity of rainfall*			Yield of canning grade tomatoes in tons/acre	
	June	July	August	Ferguson	John Baer
1951	1	1	1	27 4	27 5
1954	3	3	1	11 6	8 4
1955	3	3	1	11 9	9 3
1956	3	2	1	19 2	13 9

*1 *Well spaced*—No periods of more than 7 consecutive rainless days.
2 *Rains fairly well spaced*—only one period of 8 or more consecutive rainless days.
3. *Rains poorly spaced*—Rainless period of 14 or more consecutive days, or more than one period of 8 or more days in the month.

In years that are climatically favorable to heavy production the yield differences may not be great. In many of the tomato growing areas of eastern Ontario well spaced summer rains are of very great importance. In most locations the soils dry out rather rapidly, so that a dry period following a period of adequate moisture will soon have an effect on the marketable yield of tomatoes. Under such conditions John Baer has proved to be very susceptible to blossom end rot, and in hot weather will develop a high percentage of yellow ends. It is also very susceptible to stem end cracking, a condition favored by

Author examining Ferguson tomato. Diameter ranges from 2.26 to 3.41 inches; average 2.84 inches. Depth from 2.00 to 2.59 inches; average 2.89 inches. (Basis: 500 fruit, 2-year test, 1956, '57.)

periods of inadequate soil moisture. Under these conditions Ferguson will outyield John Baer by a considerable margin. In Table 1, an approximation is given of the regularity of summer rainfalls at Smithfield, and the apparent effect on yields of the two varieties during the years 1951 and 1954 to 1956.

In 1951, a year of plentiful and well spaced rainfalls, both varieties gave high yields of marketable fruit. In the years 1954 to 1956, the June and July rains occurred at infrequent intervals resulting in a high incidence of fruit defects in the John Baer variety and reducing its marketable yield.

The John Baer variety, although it is productive and has good quality when grown under good conditions, is inconsistent in its performance, giving good yields in favorable seasons and very poor ones when conditions are not so favorable. The Ferguson variety on the other hand is more consistent in its performance and will outyield John Baer under adverse conditions.

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PIE FILLING

Surplus Fruit Outlet

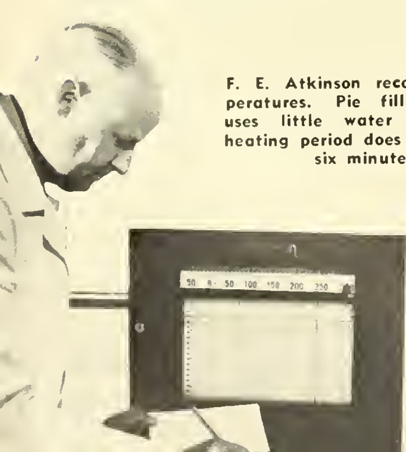
F. E. Atkinson AND *A. W. Moyls*

A. W. Moyls and Home Economist Dorothy Britton compare samples of pie filling. Acceptable consistency in the final product (inset) is objective.

THE utilization of fruits and vegetables in various processed forms—thereby helping the farmer to expand the outlets for his produce—has been the objective of the Fruit and Vegetable Processing Laboratory at the Experimental Farm, Summerland, B.C., since 1929. One of the more recently introduced products is a high fruit content canned pie filling.

Canned fruit pie fillings have been on the market since about 1946, but the Laboratory had in mind a product of maximum fruit content with a minimum of stabilizer and sufficient sugar to provide desirable sweetening. With many of the tree fruits such as apple, apricot, and peach this objective has resulted in a product which contains between 70 and 80 per cent fruit, 20 per cent sugar and from less than 1 per cent of stabilizer up to 3 per cent. With this high fruit content the product is suitable for use in pastry dainties, for cakes, flavoring for ice cream, or for serving directly as a fruit dessert.

The authors are Food Technologists with the Fruit and Vegetable Processing Laboratory, Experimental Farm, Summerland, B.C. Mr. Atkinson is Laboratory Head.



F. E. Atkinson recording temperatures. Pie filling process uses little water and total heating period does not exceed six minutes.

From the grower's standpoint it is interesting to know that fillings have been prepared from the following tree fruits: apricots, sour cherries, peaches, prunes, apples, pears; from the following berries: blackberry, blueberry, raspberry, strawberry, loganberry, and black currants. Sour cherries and all the berries have also been used in combination with apples.

While all apricot varieties produced a satisfactory product, a blend of equal parts of Perfection and Wenatchee Moorpark yielded the best product.

Excellent peach fillings were prepared from Veteran, Vedette and Valiant. Fillings from J. H. Hale and Elberta were considered satisfactory. A blend of equal parts of J. H. Hale and Elberta is suggested as being superior to either of the varieties alone.

Early and late strains of Italian prunes gave good products when the filling was prepared from fruit which contained 18 per cent or more of soluble solids at harvest.

Among the apple varieties, Jonathan made an excellent filling. It was outstanding in retention of shape, texture, flavor, and color. Good fillings were prepared from Wealthy, McIntosh, Stayman, and Winesap. The Delicious requires acidification with about 0.35 per cent citric acid in order to make a satisfactory product. Another suggestion is to blend Delicious with a berry fruit such as black currant, raspberry, or blackberry. Wealthy produced a filling typical of summer or early fall varieties. McIntosh apples should be stored at 32°F. and used before the end of December.

Thickeners investigated included various cereal and root starches, waxy maize, waxy rice, specially modified corn starch, and other 'improved' starches, derivatives of Irish Moss, locust bean gum, carboxymethylcellulose, and low methoxyl pectins. Only sufficient thickening is employed to prevent an undesirable amount of juice draining from a piece of pie. Some thickeners are definitely undesirable in that their use may result in a product that is too gummy, sets too firm, is cloudy, or off-flavor. Sometimes the stabilizing agent breaks down during canning or storage. Other thickeners have both undesirable and desirable characteristics, depending frequently on the concentration at which they have to be employed in order to give the desired degree of stability. Very few thickening or stabilizing agents are satisfactory alone, the best results usually being obtained by combining two or more.

Recent experiments, involving the substitution of low methoxyl pectins for a portion of the starchy stabilizers, have resulted in improved texture and stability of a number of pie fillings. Texture has been a problem with peach, prune, and especially apricot fillings which normally result in a glutinous product. The gel phase of fillings containing low methoxyl pectins remains clear and they do not impart an off-flavor to the product. In addition, these fillings show exceptionally good stability under low temperature storage.

The process developed from the experimental work makes use of as little water as possible and a total heating period not exceeding

6 minutes. Thickeners are added towards the end of the heating process. As the product is filled into containers at sterilizing temperatures no further cook is required. The cans are immediately cooled. This method can be adapted to many factories having conventional equipment, or it can be adapted to an automatic continuous process for large operations.

Canned fruit pie fillings should be stored at temperatures below 70°F. Above 85°F., quality loss due to color and flavor changes is quite rapid. This is especially true with fruits such as sour cherries, raspberries, strawberries, loganberries, and blackberries.

Color and flavor are most satisfactorily retained at temperatures below 40°F., with maximum retention occurring at 0°F. Quality loss during low temperature storage is generally caused by thickener breakdown and liquid separation. This problem can be controlled by the proper blending of stabilizers and incorporation of a small amount of apple sauce into the berry formulation.

The shelf life at 70°F. for fruit pie filling, excepting sour cherry and berry fruits, should exceed 16 months. Sour cherry, raspberry, and strawberry fillings held at this temperature become borderline for quality within 4 months, but can be stored at temperatures below 40°F. for at least one year.

With the Okanagan fruit area located at least 250 miles from any major market, transportation costs become an important factor. Consequently it is necessary to market only the best quality of goods in an attractive form. Fruit pie fillings provide an outlet for fruit of generally good quality which may be too small to put in Fancy or Choice canned grades or may have a blemish. While providing an outlet for the farmer's fruit, this product also caters to the consumer in giving him a higher percentage of fruit in the container than is found in any other commonly used commercially packed product.

Grasses cut down to 1½ inches (right) took longer to make one inch of new growth than those cut down to 3 inches (left). Insets show effect on root systems of grazing to 3 inches (left) and 1½ inches of stubble (right).

Clipping Experiments Guide Pasture Management Practices

R. W. Peake AND *D. B. Wilson*

GREENHOUSE STUDIES designed to measure the effect of close grazing at Lethbridge have shown marked differences in yield and rate of growth. In the first of two experiments, sods were taken from a two-year-old pasture, of the Lethbridge irrigated pasture mixture, which is seeded at the rate of brome 7, orchard grass 7, creeping red fescue 4, and white Dutch clover 2 pounds per acre. The sods were trimmed to a uniform thickness of 2½ inches, and transplanted to crocks in the greenhouse. Good growing conditions were provided throughout.

Eleven different treatments were given and rate of growth was determined by daily height measurements. At the conclusion of the experiment the plants were removed from the crocks, the soil washed from the roots, and roots examined and weighed. Table 1 shows the yields of herbage, final root weights, and rate of growth.

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Higher yields were obtained when the grasses were allowed to reach a height of at least 8 inches before clipping, and to retain at least 3 inches of stubble. Plants cut down to 1½ inches required a longer time to make one inch of new growth than those cut down only to 3 or 5 inches. Clover was abundant in the 8 to 3 and 10 to 3 inch treatment, but was completely crowded out of the 12 to 5 inch treatment. In the 4 to 1½ inch treatment clover suffered from close cropping, and contributed little to the yield.

In the second experiment, brome, orchard, and creeping red fescue were grown separately, and in mixture. Daily height records revealed that the clipping treatments affected the rate of growth of the three species differently. Table 2 shows the average time required to produce one inch of growth under each treatment. Brome and fescue recovered more slowly than did orchard grass when clipped from 6 or 10 inches down to 1½ inches. When clipped from 10 inches down to 3 or 5 inches there was little difference

TABLE 1. EFFECT OF FIVE MONTHS OF CLIPPING ON HERBAGE YIELD, ROOT DEVELOPMENT, AND RATE OF GROWTH

Height at Clipping	Height of Stubble	Yield of Herbage	Root Weight	Average No. of Days to grow 1"
Inches	Inches	Grams Dry Matter	Grams Dry Matter	
4	1½	6.7	2.5	1.9
6	1½	9.5	2.8	1.7
6	3	10.9	4.2	1.7
8	1½	11.4	3.2	1.6
8	3	17.7	4.7	1.3
10	1½	13.8	4.3	1.8
10	3	20.6	6.5	1.4
10	5	17.0	11.9	1.3
12	1½	16.4	4.9	1.8
12	3	21.0	5.2	1.4
12	5	21.2	11.5	1.3

between the three grasses in rate of recovery. Both fescue and the mixture showed more rapid regrowth as stubble height increased from 1½ inches to 3 inches. Regrowth of brome grass was more rapid with each increase in stubble height to 5 inches.

The chart shows yields of herbage and final root weights under the different treatments. Brome clipped to a stubble height of 1½ inches produced a very low yield, and was almost eliminated after only 10 weeks of clipping. As the stubble height was raised to 3 and 5 inches brome yields increased. Yields of the other two grasses increased as the stubble height was raised from 1½ to 3 inches, but there was little further advantage in leaving 5 inches of stubble. Yields of the mixture did increase further when 5 inches of stubble were left, probably the result of improved brome growth. Final root weights show that all grasses developed better root systems under the 5-inch stubble treatments than when less stubble was left. Creeping red fescue withstood the close clipping better than the other grasses, and maintained a fairly vigorous root system even when only 1½ inches of stubble were left.

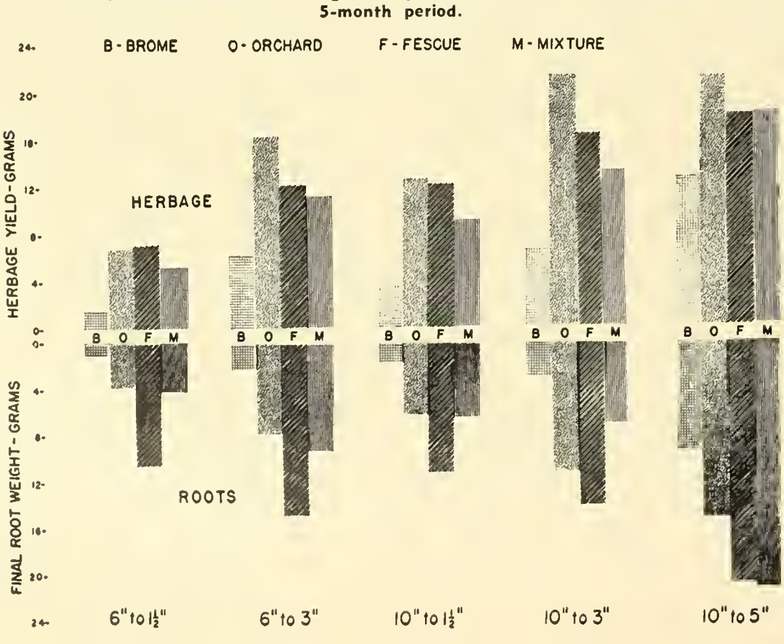
The proportions of the three grasses in the mixture varied with the treatments. The most satisfactory balance of species existed where 3 inches of stubble were maintained. When only 1½ inches of stubble were left brome grass contributed very little to the yield of the mixture.

TABLE 2. AVERAGE NUMBER OF DAYS TO PRODUCE ONE INCH OF GROWTH UNDER FIVE CLIPPING TREATMENTS

Clipping Treatment	Brome	Orchard	Creeping Red Fescue	Mixture
6 to 1½	2.4	1.8	2.1	2.0
6 to 3	1.5	1.4	1.9	1.5
10 to 1½	1.9	1.5	2.0	1.4
10 to 3	1.3	1.4	1.4	1.2
10 to 5	1.1	1.3	1.3	1.2

Protein determinations made at the beginning and end of the experimental period showed no consistent differences due to clipping. The high level of soil fertility maintained, resulted in the plants having an average protein content of 27.6 per cent at the end of the experiment.

Herbage yields and final root weights of plants clipped at various heights for a 5-month period.



Field observations of grazed pastures at Lethbridge bear out these results. Leaving a good stubble resulted in higher carrying capacity and greater returns per acre. Closely grazed pastures have been low yielding and very susceptible to weed encroachment, while those under good grazing control have remained practically weed free. The question of what constitutes close grazing cannot be answered directly without first defining the species. The graph shows that for orchard grass and creeping red fescue, 3 inches of stubble were sufficient, but for brome grass there was an advantage in leaving more. In managing pastures of these grasses then, the aim should be to graze at 10 or 12 inches and leave 3 or more inches of stubble. This, of course, necessitates provision for rotational grazing. With four or more rotation fields good control is possible, provided other management practices are adequate.

* * *

Lecanium Scales — from p. 10

in the interior of British Columbia, these enemies of the scales cannot be relied upon to bring an infestation under control. In most instances the grower must resort to chemical sprays.

Several insecticides have been tried in recent years for control of the scales in British Columbia orchards. One of the most effective compounds has been malathion, a single spray of which has consistently given good control of immature scales of the three species, when applied any time between mid-August and the last week in September.

In experiments at Summerland this spring, a new insecticide, Trithion, gave good control of two species of overwintered lecanium scales when applied at the dormant, or pink-bud stage of peach. Another new insecticide, Sevin, applied at the pink-bud stage, gave even better control than Trithion. Both materials were considerably more effective than malathion.

Before these chemicals can be recommended to fruit growers, more information must be accumulated, not only on control, but on safety to all varieties of tree fruits, compatibility with other spray chemicals, toxicity to man, and probable cost.

Genetic Aspects

of

Efficient Turkey Production

A. S. Johnson

RATE OF GROWTH in turkeys not only determines the amount of meat marketed per bird raised but also has a marked effect on the efficiency of feed utilization. Fast growing birds require less feed per pound of gain than slower growing ones. Thus the achievement of rapid growth through selection, is an important step in turkey breeding.

Variation in body size is closely linked with variability of other traits such as conformation. Selection for body size may therefore produce changes in conformation. Adverse relationships between body size and reproductive traits are not uncommon and defects such as crooked keels and abnormal hocks may increase in incidence as a result of increased body size in a strain. These defects can sometimes be controlled either through management procedures or by nutrition, but they are likely to be more common in large strains than in smaller ones. Because of these relationships, a breeding program designed to improve growth rate while avoiding introduction of bad traits, is not so simple as it might seem to be. Any breeder who is selecting for increased body size and who is disregarding information on other traits, cannot be said to have an adequate breeding program.

Research in progress at the Poultry Division at Ottawa, has shown that the growth pattern, or the rate at which turkeys grow at specific periods relative to others, can be influenced by the age at which selection for body size is exercised. If maximum improvement in body size at a certain age is required, then the birds should be selected on the basis of their weight at that age rather than at any other age. Two lines of Empire White turkeys originally formed from the same strain and almost identical in growth rate, were developed by selecting one line (A) for large 12-week body weight and the other (B) for large 24-week body weight. To permit unbiased measurement of the comparative effects of the two selection procedures, the lines were reared intermingled under the same management conditions.

Both lines have increased in body weight, but the increase in 12-week weight has been greater in Line A than in Line B, whereas the reverse situation holds with regard to 24-week weight, (Table 1). Thus, at 12 weeks, the males in Line A weighed 0.3 pounds more than those in Line B, but at 24 weeks they were one pound lighter. The important point is that a criss-crossing of the growth curves of the two lines was brought about by the selection procedure. In each line there was a general increase in growth, some of which may have been due to environmental effects but the response was greatest in each line at the age at which selection was practised. This means that a breeder can make progress in developing a "broiler" strain of turkeys by selecting for weight at broiler age. These results indicate that mature market weight (at 24 weeks) can be improved most efficiently by selection at that age. One must balance against this the fact that selection at 24 weeks is likely to result in later maturity than selection at an earlier age. Other undesirable effects, to be considered later, were also obtained in the line selected at 24 weeks of age in this study.

It is unlikely that one can select for one trait without causing changes in others, because of genetic correlations between traits. Since only body weight was under selection in this experiment, it was possible to measure the resulting changes in other characteristics. The maximum skeletal change was in shank length of the males at 12 weeks and amounted to about 5.0 per cent. Keel length changed, at the most, 2.2 per cent. Thus the major response to body weight selection was in fleshing, since the increase in total body weight was (in the males) of the order of 10 to 11 per cent. Other research data have shown a positive correlation between body size and percentage of fleshing on the carcass. An apparent slight decline in width of breast during the two generations of selection suggests that a breeder wanting to maintain breast width in his strain while selecting for body size, may have to exert some selection pressure on this trait.

Changes in reproductive performance were found in the two generations of selection. Egg size increased about the same amount in each line, from 83 grams in 1954 to 94 grams in 1957, or 13 per cent. Although there was no decline in fertility (artificial insemination was used), an important difference between the lines occurred in hatchability. The hatchability of fertile eggs fell appreciably in Line B, to the point where, in 1957, it was 15 per cent lower than in Line A. This is shown clearly

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by Table 2, which also shows the marked deficiency in hatching ability in Line B in 1957 in relation to Line A, as indicated by the percentage of normal poults hatched. The implication from these results is that hatchability can be adversely affected if selection is based on body weights at maturity rather than at an earlier age. While specific for one selection program within one strain, it is likely that these results have more widespread application. Late selection on the basis of mature body weights may be harmful to the breeding performance of a strain.

While it appears desirable to select for body size on the basis of early weights, a complication occurred in this strain. There was an increase in the incidence of abnormal hocks, occurring at 16 to 20 weeks of age, in the males of

TABLE 1. BODY WEIGHT (IN POUNDS) OF MALE AND FEMALE TURKEYS UNDER SELECTION FOR HIGH WEIGHT

Year	Line**	Males		Females	
		12 wk.	24 wk.	12 wk.	24 wk.
1954*	A	9 0	21 5	7 0	13 3
	B	9 0	21 2	7 0	13 0
1955	A	9 5	21 9	7 3	13 6
	B	9 3	22 3	7 1	13 5
1956	A	10 0	22 6	7 6	14 0
	B	9 6	23 5	7 4	13 9

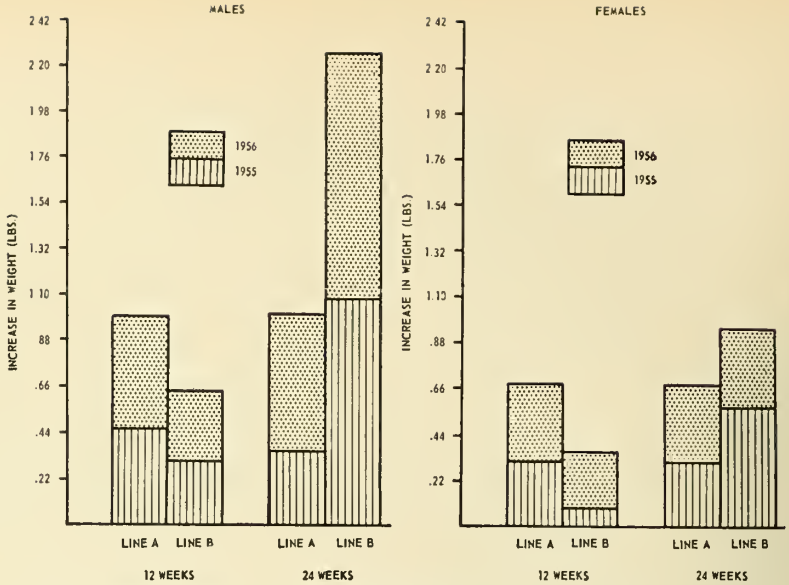
*No selection in 1954.
**Line A selected for high 12-week weight, Line B selected for high 24-week weight.

TABLE 2. HATCHING RESULTS OF TWO LINES UNDER SELECTION FOR BODY WEIGHT

Year	Line	% fertile	% dead in shell	% fertile hatch	% normal poults
1954	A	91	20	68	54 0
	B	87	19	70	54.9
1955	A	82	18	66	53 1
	B	87	22	65	55 8
1956	A	85	14	74	61 7
	B	81	28	62	48.0
1957	A	94	16	73	67 0
	B	92	30	58	50 2

TABLE 3. MORTALITY AND DEFECTS OF TWO LINES UNDER SELECTION FOR BODY WEIGHT

Year	Line	Mortality (%)		Breast blisters (%)	Crooked hocks (%)
		0-42 days	0-168 days		
1954	A	5 5	10 0	0 9	0 0
	B	6 7	10 0	0 7	0 0
1955	A	6 6	9 3	0 8	11 5
	B	10 0	13.1	1 1	8 6
1956	A	3 9	7 1	0 9	7 0
	B	7 1	10 8	2 8	2 6



Body weight increases in males and females in two lines following selection (since 1954).

Line A (Table 3), in relation to that in Line B. This type of leg abnormality is more of a problem under conditions of early rapid growth. Apart from weight differences, some strains seem to be more prone to be affected than others. There are, however, marked genetic differences affecting its expression, since, in 1955, the incidence among the male progeny of 20 sires varied from 5 to 50 per cent. These differences were not closely associated with early growth rate, as measured by 12-week body weight. Thus it appears that when early growth is being improved by selection, progress can also be made in increasing the resistance to this hock disorder, under conditions where it expresses itself.

The importance of genetic differences in mortality has received very little attention in turkey breeding research. Moderate differences in mortality have an appreciable effect on profits because of high poult costs and the relatively large amount of feed consumed. These results showed that selection for viability should receive as much attention in turkey breeding programs as it does in chicken breeding. Mortality to 24 weeks of age, of poults raised as they were in this project under uniform environmental conditions, varied between sire-progeny groups from 0.0 to 20.0 per cent in 1955 and from 3.9 to 22.0 per cent in 1956. The important point is that genetic changes in viability of a strain can occur and a breeder should consider viability as an important trait for which to select. The acquisition of this and other genetic information, to permit an adequate breeding program, makes pedigree breeding essential.

Breast blisters were found more frequently in Line B than in Line A, probably because of the larger weight at maturity of the Line B birds. All the birds were housed at night in range shelters with slatted floors, which probably accentuated the condition. Under certain management procedures this would not be a problem, but a strain relatively free from the defect under all environmental conditions would be an advantage.

Straining Milk . . . from p. 7

to cheese not exceeding the No. 2 disc on the extraneous matter test; and starting July 1, 1957, no cheese is acceptable as First Grade unless it meets this standard. Extraneous matter poses a serious problem that can only be solved satisfactorily at the farm. Milk on arrival at the cheese factory may pass the sediment test, yet the cheese made from such milk may be degraded for excess extraneous matter. Why? The answer is simple. In making cheddar cheese, roughly eleven pounds of milk is required to make a pound of cheese. This means that all the sediment in eleven pounds of milk is concentrated into one pound of cheese.